MT²¹

ENTERPRISE

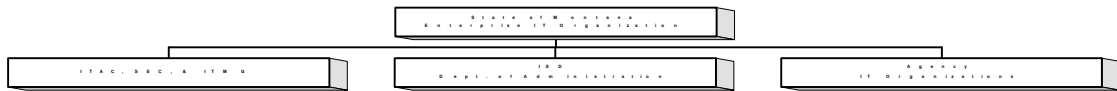# *INFORMATION TECHNOLOGY ARCHITECTURE*

INTRODUCTION

The Information Technology Architecture (ITA) is a framework for linking the physical components of IT (computer hardware, software, and telecommunications) to the business objectives defined by the organization. The State of Montana's ITA is administered through the enterprise organization composed of the Information Technology Advisory Council (ITAC); the SummitNet Executive Council (SEC); the Information Technology Managers' Group (ITMG); the Department of Administration Information Services Division (ISD); and Agency Information Technology Organizations.

These state IT advisory groups, ISD, and the agencies work as a team to set standards for enterprise computing hardware, software, and telecommunications. Using the enterprise organization to manage the ITA encourages: hardware platform connectivity; application and database sharing; the development of high-speed transmission mediums for voice, data, video, and imaging; the establishment of worker competency levels and training support; and software acquisitions that are compliant with established hardware and network standards. The ITA also supports important business goals such as providing faster, convenient, and more accurate services to Montana's citizens; promoting cost-effective IT use; and increasing worker productivity.

An understanding of the current ITA is essential for strategic planning and setting future IT direction. The *1996-97 Information Technology Plan* established a foundation for enterprise IT strategic planning. The *1998-99 Information Technology Plan* expands on this foundation to prepare Montana for the 21st Century — MT²¹.

ENTERPRISE ORGANIZATION

As shown in *Figure 1* and discussed below, the State of Montana's enterprise IT organization consists of ITAC, SEC, ITMG, ISD, and Agency Information Technology Organizations.

ITAC, SEC, & ITMG

ITAC
The Information Technology Advisory Council consists of agency directors; deputy directors; and representatives from city/county governments, the universities, and the executive, legislative, and judicial branches. ITAC serves in an advisory capacity for: reviewing statewide information and data processing policies; making recommendations regarding the application of new IT in state government; and advising the Department of Administration concerning long-term strategic planning for IT in state government. The current ITAC membership is listed in *Appendix A*.

SEC
The SummitNet Executive Council was created in July 1995, by Executive Order of the Governor, to provide policy-level direction for matters relating to SummitNet. SEC consists of representatives from the executive and legislative branches; higher education; and local government. The current SEC membership is listed in *Appendix A*.

ITMG
The Information Technology Managers' Group consists of agency IT managers or system coordinators plus representatives from city/county governments, the universities, and the executive, legislative, and judicial branches. ITMG reviews and makes recommendations on enterprise IT issues; reviews and provides feedback regarding information management policies established by ISD; and participates in statewide IT planning efforts. The current ITMG membership is listed in *Appendix A*.

Information Services Division

As a division of the Department of Administration, ISD has a two-fold mission: 1) to provide services and assistance to state agencies in accomplishing their functions through the cost-effective use of IT, including data processing, telecommunications, office automation, and application systems design and development; and 2) to establish statewide IT policies and strategic direction to satisfy future demand for services. ISD's organizational structure is shown in *Figure 2*. Its authority and responsibilities are described in MCA (Montana Code Annotated) Sections 2-17-501-503, 2-17-301-302, 2-6-203-206, and 2-6-212. These Sections are provided in *Appendix C* of this document. Additional authority and responsibilities regarding 9-1-1 services are defined in Sections 10-4-101 through 10-4-303, which are not provided within *Appendix C.*
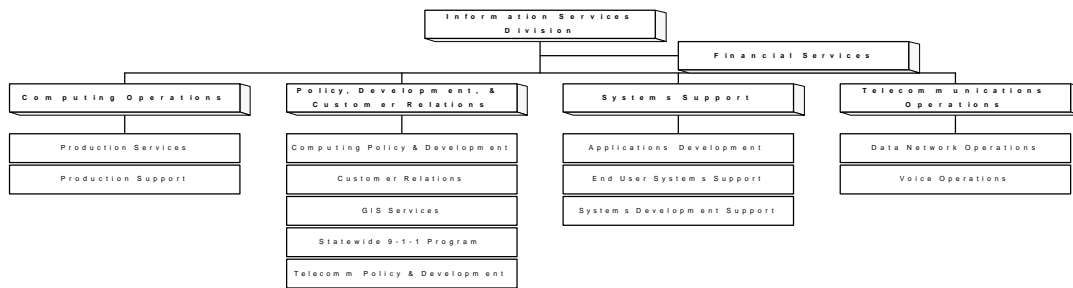
Policy, Development, & Customer Relations Bureau

The mission of the Policy, Development, & Customer Relations Bureau is to develop computing and telecommunications standards and policies; promote technology development; manage the statewide 91-1 program; coordinate IT training offerings; provide division-wide customer relations; and coordinate state geographic information system (GIS) activities, including a governance structure for addressing GIS policy issues. The GIS portion of this mission statement is fulfilled by the Bureau's GIS Services Section which was established during the first quarter of FY97.

Computing Operations Bureau

The mission of the Computing Operations Bureau is to provide reliable, effective, and efficient centralized computing services to state agencies and other government units 24 hours per day, seven days a week. The Bureau consists of two sections: Production Services and Production Support. Production Services is responsible for the ongoing operation of mainframe and centralized mid-tier production computer configurations. This section is always focused on accommodating the growing automated workload demands of state agencies. Production Support is responsible for configurations; operating systems and maintenance; network interface support; methods/media management; and centralized security administration.

These sections provide professional computing operations support services; develop training curriculum; provide problem and change resolution in support of current software products; evaluate and install new software and hardware products; and determine the methods and use of software products by state employees. In addition, this Bureau is continually seeking innovative means to make the state's mainframe and shared mid-tier configurations more compatible and compliant with the growing IT processing needs of state agencies.

Systems Support Bureau

The mission of the Systems Support Bureau is to support state agencies in their implementation and use of IT by providing: application system design, development, and support services; technical support services for software used by professional data-processing staffs; technical support services for software and access technologies employed by IT users; coordination and management of the selection of standard software applications; and emerging technology assessment and planning. This Bureau includes three sections: Applications Development; End User Systems Support; and Systems Development Support. The Bureau supports the mainframe legacy environment plus the client/server and personal computing environments.

Telecommunications Operations Bureau

The mission of the Telecommunications Operations Bureau is to provide cost-effective, reliable voice, video, and data services for all state agencies, the University System, and other government units. The Bureau is divided, by function, into two sections. The Data Network Operations Section supports the state's local- and wide-area-network infrastructure, including SummitNet, the state's frame-relay, multi-protocol, routed network; an SNA multi-drop network; a campus fiber-optic backbone; the Novell Network Operation System; and the Network Assistance Center. The Voice Operations Section

oversees the operations of the state's telephone switches, voice mail, and integrated voice response systems; the video systems; and the statewide telecommunications backbone network. The Telecommunications Operations Bureau provides first-level support relating to voice and data network problems; coordinates network add, move, and change activity; oversees multiple vendor contracts supporting the statewide telecommunications infrastructure; and provides network design and consultation to all state agencies.

Agency Information Technology Organizations

IT environments vary greatly among the agencies. The total number of agency FTEs in IT-classified positions exceeds 380 (Personal Services Survey, ITAC Coordination Task Force, November-December 1995). Of that total, 73% is contributed by seven agencies that each have 20 or more IT-classified FTEs. By contrast, the seven agencies with fewer than five IT-classified FTEs each, account for only 3% of the overall total. Systems analysis and programming activities account for approximately one-third of the total FTE time, and end-user support is the next largest support activity.

ISD centrally administers the only two mainframe computers in Montana state government and, since July 1997, offers processing on a mid-tier computing platform. Many agencies also maintain their own mid-tier and PC- or PC/LAN-based systems. For example, there are more than 55 mid-range computers deployed in the agencies. The state is actively converting enterprise LANs to the NetWare 4.1 release. In October 1996 there were approximately 70 LAN servers running 4.1, and that number was expected to increase to about 100 by the end of calendar year 1996.

Through connectivity to ISD's mainframe, all agencies have access to statewide application systems such as SBAS (Statewide Budget and Accounting System), and P/P/P (Payroll/Personnel/Position Control). In addition, the agencies run a wide variety of custom-written and commercial software across all platforms. As in other IT areas, the enterprise has established standards, with which the agencies comply, for desktop and LAN operating system software, as well as for desktop application software.

Despite the diversity of agency systems and environments, state government has an unlimited potential to share information and resources across all agency platforms. This is made possible by the collaborative efforts of the agencies (through ITAC, SEC, and ITMG) and ISD in adopting standards and strategic direction that establish the foundation on which the enterprise is built.

STATE IT EXPENDITURES

The data shown in *Figures 3 - 5* detail expenditures from the executive, legislative, and judicial branches of state government; not included are the Board of Education, the Commissioner of Higher Education, the University System, or other educational entities.

These expenditure data were obtained from fiscal year 1996 disbursements. Due to variations in the agencies' use of state object (cost) codes, the data provided in these three figures should be considered representative but not all inclusive.

IT Expenditure Categories

In *Figures 3 and 4* fiscal-year totals have been subdivided as follows: Personnel, Training, Hardware, Software, Telecommunications, Maintenance, Contracted Services, and Miscellaneous/Other. Each of these spending categories is described in more detail below.

Personnel
The Personnel bar represents the personnel services expenditure from the three branches of state government. It should be noted that this expenditure reflects *only* state employees *directly* involved in providing *IT* services. Although many other state employees who are *not* classified as IT personnel *indirectly* perform IT functions, they are not represented in *Figures 3 and 4*

Training
The Training bar includes IT training and education expenditures.

Hardware, Software, Telecommunications, and Maintenance
These categories represent expenditures for IT assets, facilities, and support. This includes: mainframe, mid-tier, and PC hardware and software; local and wide-area hardware, software, and facilities; and local and long-distance voice circuits and maintenance contracts.


Contracted Services

This category represents contracted IT consulting services, application system development, and programming services.

Miscellaneous/Other

These expenditures consist of data processing supplies such as paper, printing, microfilm, subscriptions, recruiting, and rent.
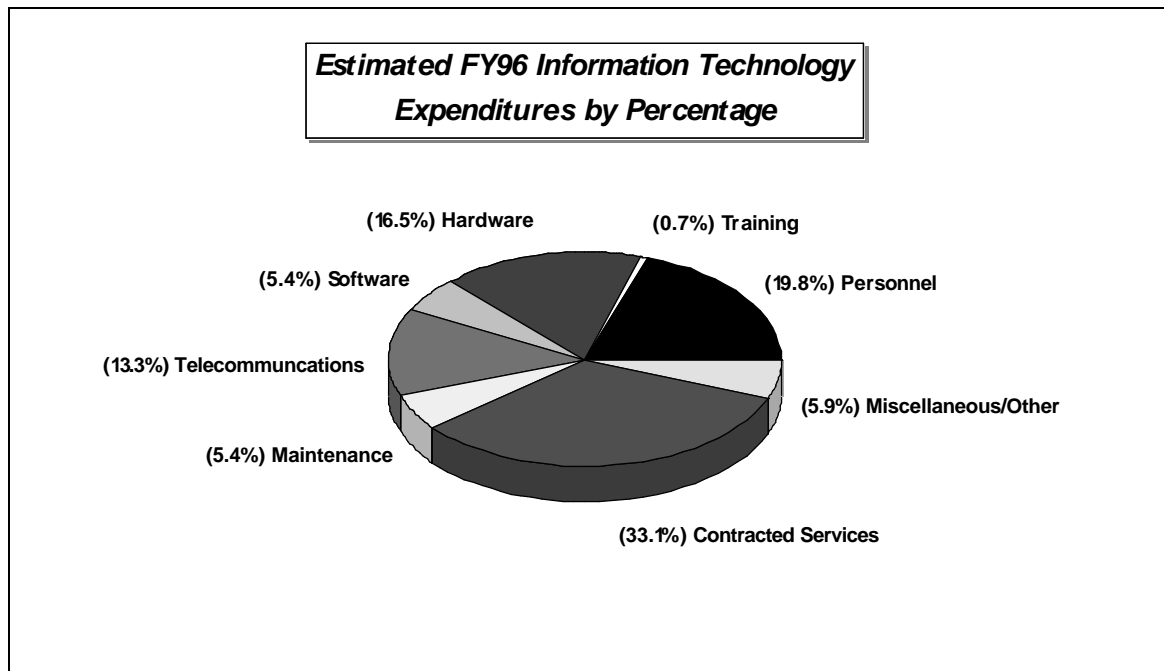
IT Expenditure Analysis

The total, statewide, IT expenditure for *Fiscal Year 1996* was approximately $57.2 million
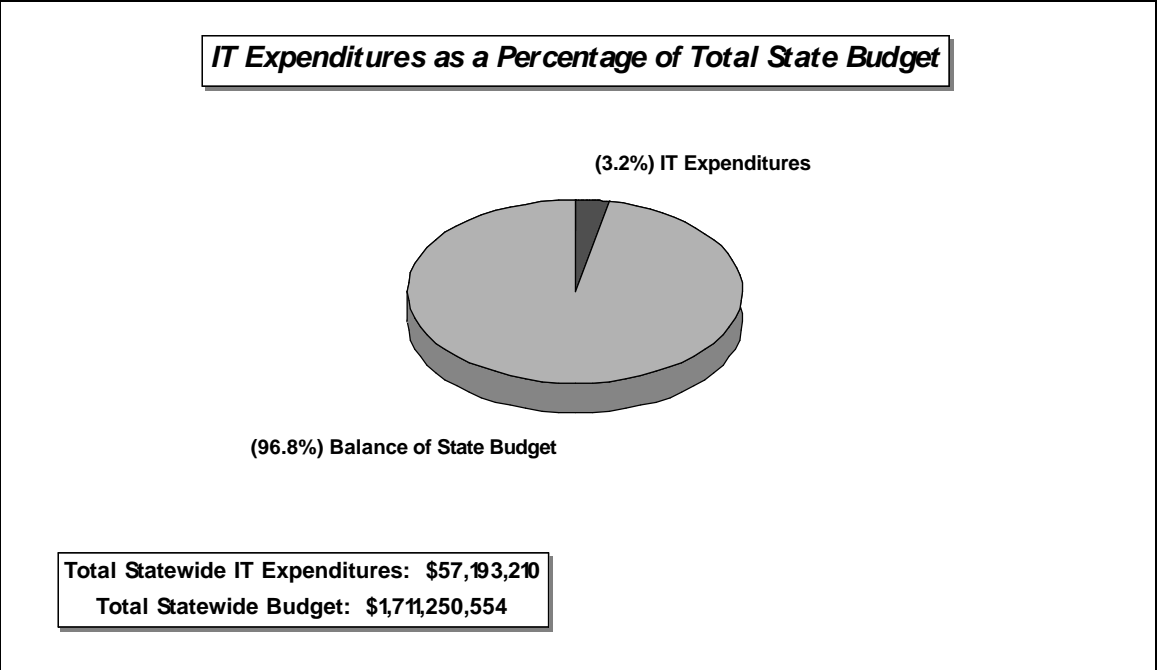

Estimated FY96 Information Technology Expenditures

Total Statewide IT Expenditures: $57,193,210
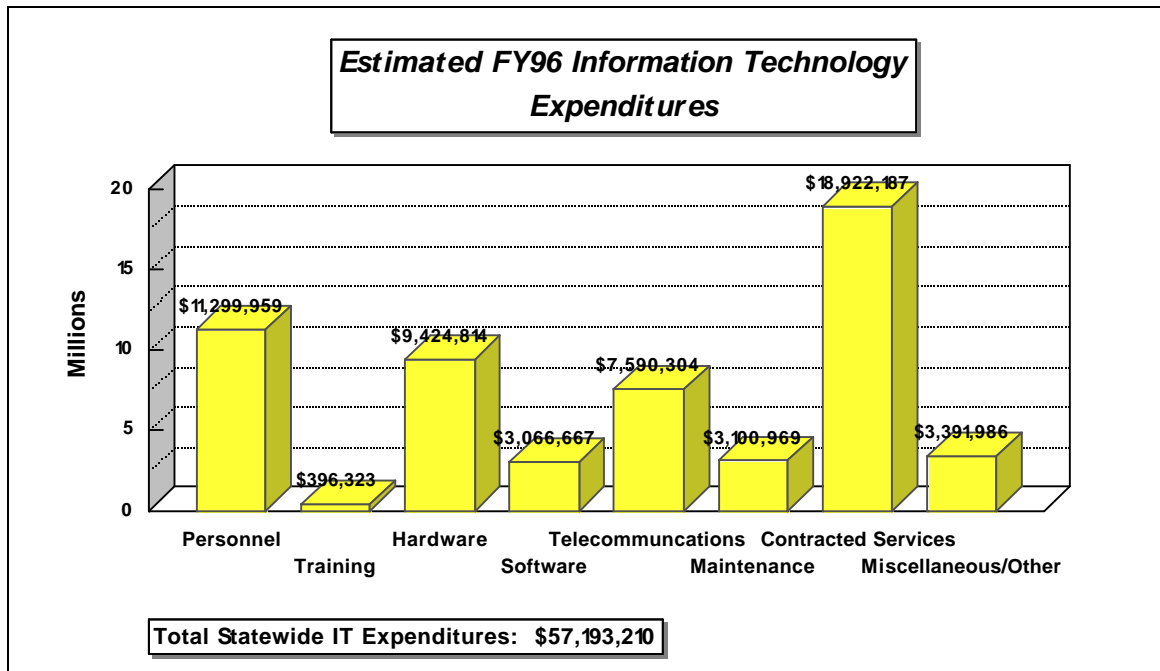
(*see Figure 3*).

Figure 4 represents statewide IT expenditures, with spending subcategories shown by percentage.

Estimated FY96 Information Technology Expenditures by Percentage

(16.5%) Hardware
(0.7%) Training
(5.4%) Software
(19.8%) Personnel
(13.3%) Telecommuncations
(5.9%) Miscellaneous/Other
(5.4%) Maintenance
(33.1%) Contracted Services

In *Figure 5*, statewide IT expenditures are represented as a percentage of budgeted funds for *Fiscal Year 1996* (as provided by the Office of the Legislative Fiscal Analyst in the 1997 biennium budget analysis). Note that IT expenditures account for only slightly more than

IT Expenditures as a Percentage of Total State Budget

(3.2%) IT Expenditures

(96.8%) Balance of State Budget

Total Statewide IT Expenditures: $57,193,210
Total Statewide Budget: $1,711,250,554

3% of the total budgeted funds.

CURRENT INFORMATION TECHNOLOGY ARCHITECTURE

In general, ITA components can include hardware, software, telecommunications, and any other IT that will help an entity meet its business goals. As discussed above, the enterprise organization manages the state's ITA, thereby ensuring a powerful resource to support state business goals. As shown in *Figure 6* and discussed below, the state's current ITA includes computing platforms; enterprise software services; and telecommunications/networking, which encompasses statewide telecommunications and data networks.
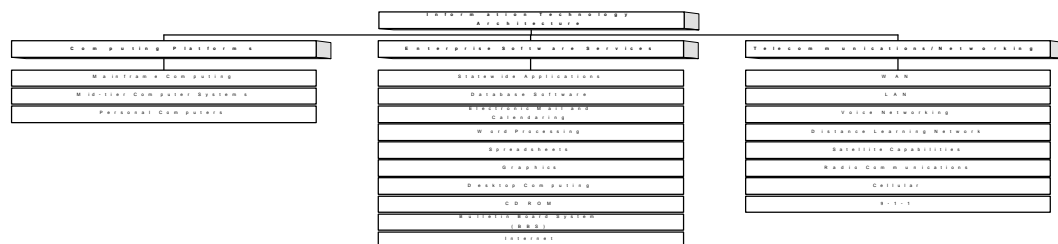
Computing Platforms

The State of Montana develops and maintains applications on various computer platforms. Large, statewide applications, such as the Statewide Budget and Accounting System (SBAS) and Payroll/Personnel/Position Control (P/P/P), are run on ISD's IBM ES 9000-832 mainframe. The University System, the Departments of Transportation and Natural Resources, and other state agencies develop and maintain applications on Digital Equipment Corporation's (DEC) VAX platform. In addition, the Department of Justice operates the Criminal Justice Information Network (CJIN) system on ISD's IBM 4381 located in the National Guard Armory Building in Helena.   Mid-tier computers provide an agency-level application and database development platform, and personal computers (PCs) are widely used for wordprocessing, spreadsheets, electronic mail, terminal emulation, and small data-management tasks.

Mainframe Computing

Although growth in the use of alternative computing platforms (personal and mid-range computers) has been dramatic, mainframe computing continues to grow significantly every year. ISD mainframe use in FY96 increased 83% from FY94, and represented a four-fold increase over FY92. This growth in mainframe use has allowed reduced computer processing rates, while improving performance and expanding services.

During the next five years, agencies will continue to use the ISD mainframe to accommodate many automation needs. Improved price and performance of the Data Center (reflected in consistent, annual rate reductions) will continue to keep this platform competitive with alternative platforms. In addition, mainframe technology is yet unmatched in its ability to provide high performance computing and economical storage of vast amounts of information. Recent hardware and software enhancements made to the mainframe infrastructure have improved service and provided a more effective computing environment. Hardware enhancements include faster computer processors; more efficient storage access; and improved computer output options. Software enhancements include automated report distribution with online report viewing; automated computer job scheduling; and automated processing facilities.

Figure 7 shows ISD mainframe usage in terms of online transaction-processing services (such as Batch, CICS, TSO, and IDMS). The decline in rates for these mainframe services is depicted in *Figure 8* Both figures show actual usage and rate information for fiscal years 1989-96, and projected usage and rate information for fiscal years 1997-99.

Mainframe Rates

CPU Rate Per Second — chart showing BATCH, CICS, TSO, IDMS rates from FY89 to FY99.
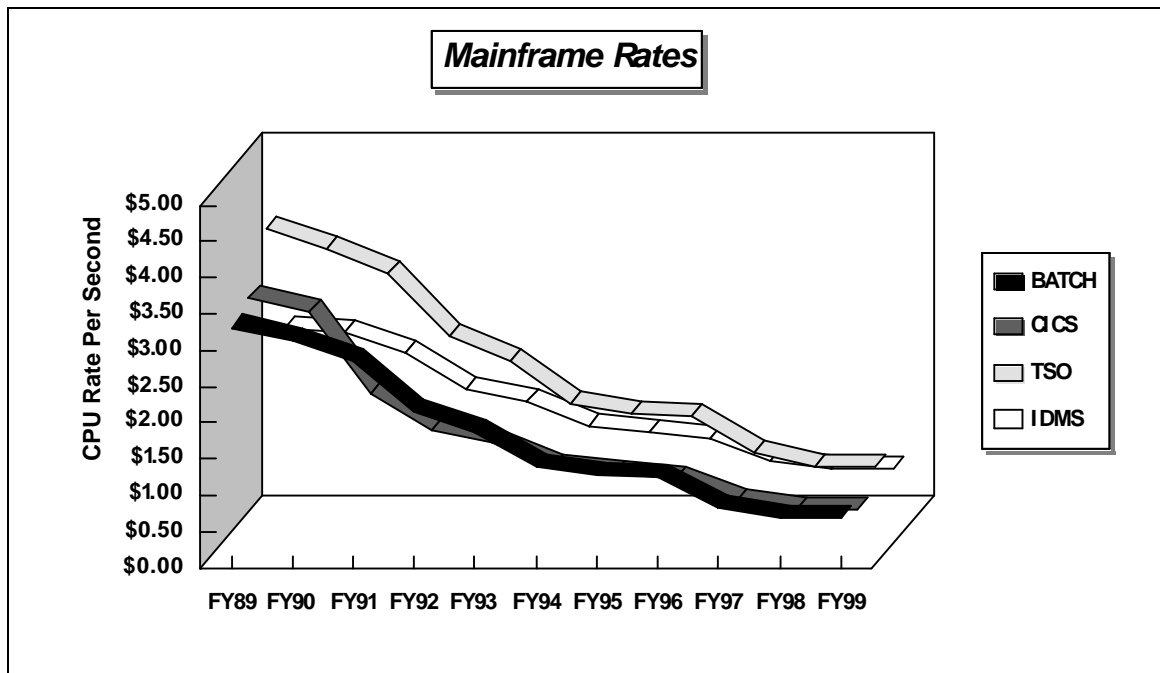
Mid-Tier Computing Systems and Standards

The state formally established mid-tier computing standards for the enterprise in July 1995 when ITAC adopted the recommendations proposed in the "Report of Mid-tier Computing Standards and Recommendations" document developed by ISD and ITMG.

In July 1996, ISD awarded a contract to Digital Equipment Corporation for a DEC Alpha 4100 computer and now provides enterprise mid-tier services for state agencies. The objectives of this offering are to supply effective mid-tier computing for state agencies that are interested in contracting for this service; provide a cost-effective computing facility and services by leveraging personnel, operational, hardware and software expenses over a broader range of users; and furnish an environment and facilities that support a production dependancy.

Several agency systems already reside on mid-tier computing platforms. The Department of Public Health and Human Services' Medstat Reporting System and the State Fund's Benefits Information System (BIS) reside on the IBM RS6000 platform. Other mid-tier computing platforms currently in use include: the DEC Alpha platform used by the Departments of Commerce, Transportation, and Labor and Industry; and the Sun Microsystems' SPARC platform used by the State Library (NRIS, the Natural Resources Information System) and the Department of Natural Resources. The use of mid-tier computing platforms is expected to increase in the next five years as agencies develop new applications and convert legacy systems.

Personal Computers

Currently there is an installed base of more than 7000 network-attached PCs statewide.

The state has established the IBM-compatible as the standard for PCs. Term contracts are in place with Dell, Digital, and IBM for the purchase of PCs and peripherals. By limiting the number of contracted vendors, the state has been able to standardize on key system components while continuing to develop and maintain a well-supported, reliable enterprise network. The term contracts are managed by ISD, who reviews and approves these acquisitions. During the next five years, the state anticipates adding or replacing 1500 to 2000 PCs annually.

Enterprise Software Services

During the past biennium, the commitment to enterprise software solutions continues to be demonstrated through ITAC, SEC, ITMG, and ISD cooperative efforts, which have defined electronic mail directions; selected a desktop database standard; and provided overall tactical and strategic planning.

Statewide Applications

Several large, statewide applications exist to support agency administrative activities. These systems provide centralized functions, primarily on the mainframe platform, and include the Statewide Budgeting and Accounting System (SBAS); Payroll, Personnel, and Position Control (P/P/P); and the Warrant Writing System. All state agencies use these systems to accomplish common administrative processes through a single, consistent means. In existence for over a decade, these systems have evolved as IT has advanced. SJR 23 recommendations (see Section 2 – Enterprise Strategic Planning Initiatives) include tactical and strategic plans to improve these systems by making them easier to use, allowing management increased access to information, and better integrating financial processes.

Database Software

By 1977, implementing large and complex application systems with existing software had become increasingly difficult. As a result, mainframe database management systems (DBMS) were evaluated, and the Integrated Database Management System (IDMS) was selected as the mainframe database product. The state has a significant investment in IDMS, and ISD will support this architecture as agencies continue to develop mainframe database systems.

From IDMS's initial use until the early 1990s, there was little interest in data sharing, especially across agency lines. However, as more agency programs were automated, duplicate efforts, and the potential benefits of sharing resources, became apparent. In addition, major IT developments allowed for more computing power at the desktop. In 1992, ITAC and ITMG responded to these factors by adopting the Data Sharing Resolution (see *Appendix D)*

In 1993, an ITMG subcommittee was formed to define the state's database direction and promote agency data sharing. The subcommittee studied and evaluated the technology available and addressed the need to share data across all platforms and between agency databases. In the spring of 1994, ITAC adopted Oracle Corporation's software as the

relational database standard for the state, which culminated in a contract for statewide enterprise database software. Agencies can now develop applications on several platforms and have the capability to share information across agency lines.

Electronic Mail and Calendaring

Electronic mail (e-mail) is extensively used in state government for exchanging messages, documents, and files. Its benefits include worker productivity gains; cost savings; and faster, more efficient, service delivery. The state's enterprise e-mail system consists of several PC, mid-tier, and mainframe products that allow information exchange among state agencies and university units. There are approximately 6900 e-mail users connected to the enterprise email system, and many of these users exchange messages and documents with Internet users throughout the country and the world. In addition to e-mail, many state workers use electronic calendaring to manage their calendars and to schedule meetings with others.

The current electronic mail and calendaring technology was selected in 1992 based upon the telecommunications capabilities at that time. With implementation of SummitNet, other capabilities are now possible. In addition, the current primary product, ZIP!Office from Attachmate, is no longer being enhanced and soon won't be supported, so a new selection will be necessary. Today's products, in addition to electronic mail and calendaring, provide a variety of worker productivity tools including: group conferencing and discussion; personal information managers (PIM); document management; and workflow and process management. The enterprise electronic mail strategy for the next five years includes the replacement of the existing electronic mail system and the expansion of capabilities for agencies to implement additional groupware features.

Word Processing

WordPerfect has been the state word-processing software standard since 1984. Used on the majority of PCs in state government, it is currently the most widely used state application. WordPerfect runs on both DOS and Windows PCs, as well as on some of the DEC VAX systems. As users convert to the Windows version, they will use more of its desktop-publishing capabilities.

Spreadsheets

Lotus 1-2-3 has been the state spreadsheet software standard since 1984. It runs on both DOS and Windows PCs and is extensively used in all agency and department applications.

Graphics

Lotus Freelance and CorelDraw are the state graphics software standards. Lotus Freelance is used for creating business charts, graphs, and slide shows. CorelDraw is a high-end drawing package used for more technical or complex drawings.

Desktop Database Standard

In addition to the Oracle enterprise database software standard, Lotus Approach has been selected as the state desktop database software standard. Lotus Approach provides desktop database capabilities for non-mission-critical agency applications.

Windows

Windows has been established as the state, standard, graphical user interface (GUI) product. Most agencies have made the transition to the Windows environment, and the ITAC minimum technology initiative will encourage further migration to this technology. State agencies began migrating to the Windows 95 version during FY97. Subsequent to this migration, Windows 95 releases of standard desktop software products will be available, and agencies will be migrating to new versions of other applications, such as WordPerfect and Lotus.

Bulletin Board System (BBS)

ISD offers a central BBS, operated by the Office of Public Instruction, that provides pertinent agency information to the public. Multi-user access is obtained through in-state 800 and local Helena telephone numbers, and through the state's capitol-complex backbone. A wide variety of state agency information is available, including road and weather reports, legislative news, agricultural information, Supreme Court decisions, public meeting notices, and board vacancy postings. BBS use has grown steadily, with more than 50,000 calls placed in FY95. Continued BBS growth is expected, and planned improvements include an easier interface for Windows users and formats that allow for greater universal public access, including from the Internet. Eventually, the goal is to have one access system that disseminates state information to the public, thereby avoiding redundant posting efforts by the agencies.

Internet

As shown in *Figure 9, Montana Online*, the State of Montana's Internet home page, received more than one million "hits" from October 1995 through May 1996. Of that total, almost 42,000 represented unique, individual visits. Currently, the home page is receiving about 9000 hits daily. Although most of the sessions during this eight-month period were initiated from within the United States, many others originated from foreign countries, including Australia, Austria, Canada, Denmark, Finland, France, Germany, Hong Kong, Hungary, Iceland, Italy, Japan, Mexico, Morocco, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.

Visits to Montana Online
(Oct 95 - May 96)
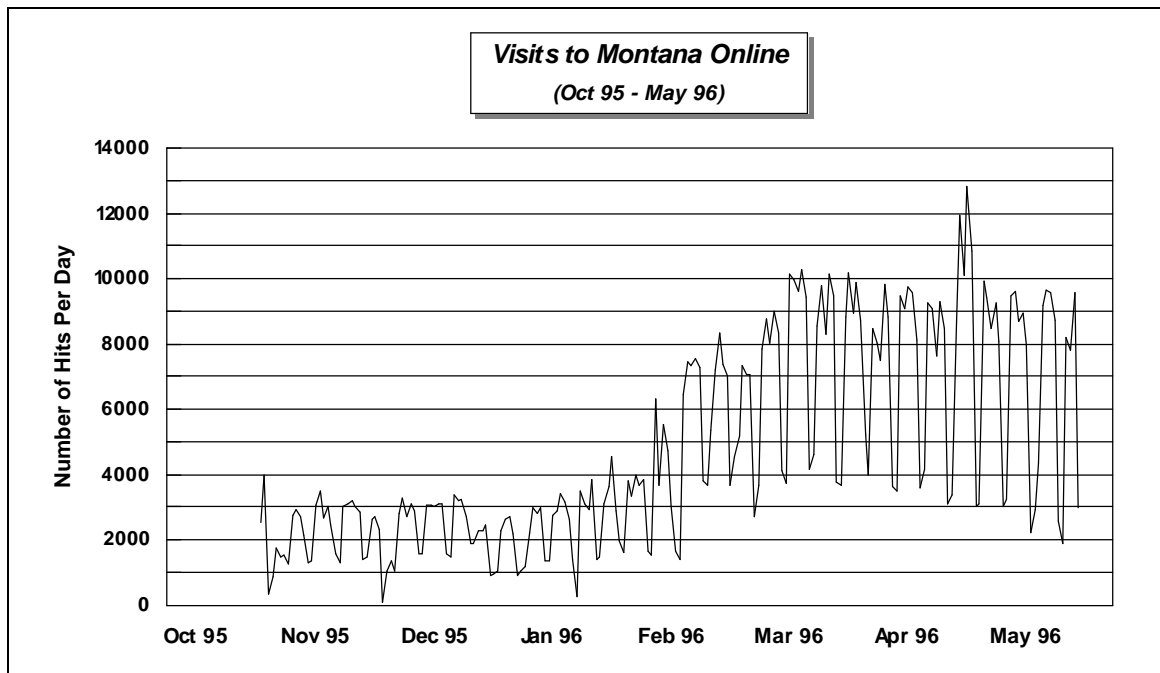
Telecommunications/Networking

Figure 10 shows the State Telecommunications Network (STN) which provides data, voice, and video communications to state and local government, law enforcement agencies, and educational institutions throughout Montana. The STN is built on facilities leased from telecommunications companies (one route, Bozeman to Helena, consists of a jointly owned/leased facility). The STN supports telephone and data communications for all state agencies. In addition, it manages two-way, interactive, video communications between 13 cities, with connections to other intra- and interstate video providers, and supports two-way radio communications and FM radio broadcasts (KUFM).
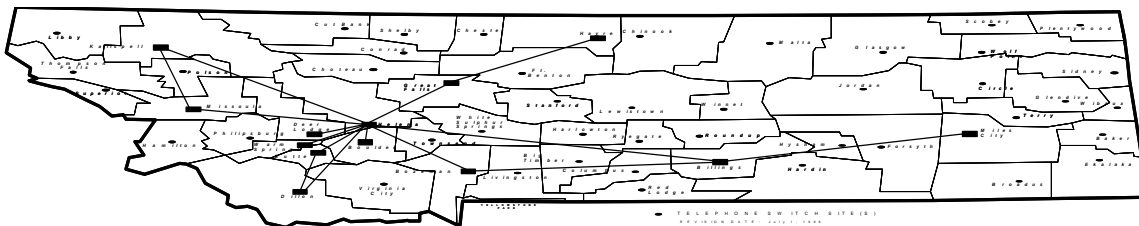
This enterprise network is one of Montana's greatest IT strengths since substantial savings are realized through the economies of scale of managing one state network. Expansion of the network during the next five years will improve capabilities for voice and

data traffic, video, two-way radio and wireless transmissions, and broadcast radio and public TV signals.

Data networking is probably the most complex element of the state's enterprise networking environment since it involves interfacing diverse applications and data located on different computing platforms. As agencies look at data sharing, downsizing, and the reengineering of applications and processes, the enterprise must be proactive in procuring a solution for interfacing heterogeneous databases.
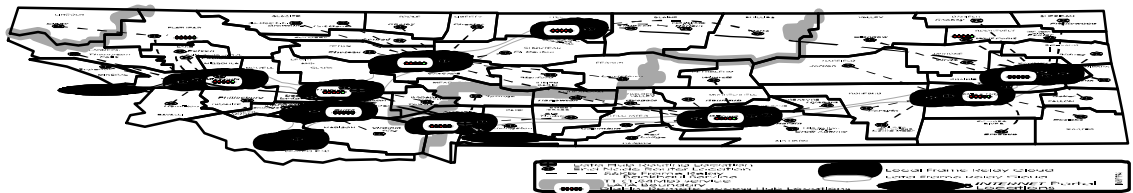
Wide-Area Data Networks

Two wide-area networks (WANs), managed by ISD, operate over the STN: the SNA data network (IBM's System Network Architecture) and SummitNet (State and Universities of Montana Multi-Protocol Network). Although the state currently uses both of these networks, the SNA network will eventually be collapsed into SummitNet once it is fully deployed.

SNA Network.   As shown in *Figure 11*, state agencies use the SNA to connect to the state's IBM mainframe, which is located in Helena. The SNA links 4300 devices, at 450 sites, to that mainframe. During the 19 years this network has been in place, it has provided reliable, manageable, efficient, and cost-effective networking services.
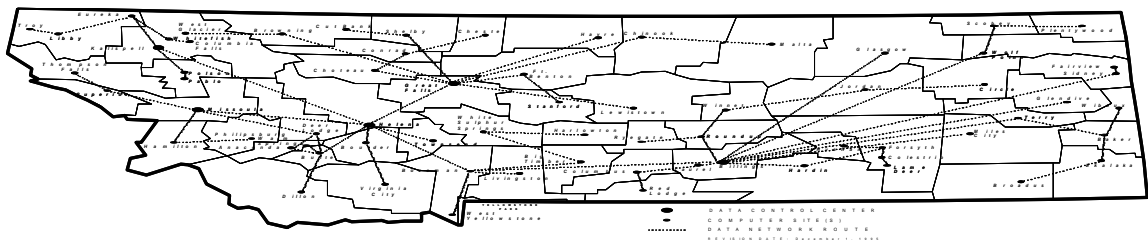
SummitNet.   This network provides the agencies and universities multiple computing platform interconnectivity. In existence since 1992, SummitNet handles different types of network traffic and offers more functionality, than the SNA network, by supporting multiple protocols over a frame relay, routed, network infrastructure. As shown in *Figure 12*, the state has an aggressive implementation plan and expects to have SummitNet fully deployed during 1998. The state expects that growth in the number of applications residing on this network will generate more network users and increase the demand for services. Eventually, SummitNet will provide network connections for state offices and other political subdivisions in all of Montana's 56 counties.

Local-Area Data Networks

Computers within an office or a building, or within a local campus area, are connected by networks called local-area networks (LANs). LANs first appeared in the state around 1987 and have expanded so rapidly that today virtually all of the state's computers are attached to a LAN. They are primarily used to share computer disk storage, computer software, printers, and other resources among many PC users.

ISD manages LANs in counties throughout Montana, and these LANs provide communication facilities for all of the state agencies to share. Typically, LANs are connected through the state's existing wide-area data network or the capitol-complex fiber-optic backbone.

ISD has extended the capitol-complex fiber-optic backbone to serve 14 buildings. This backbone handles LAN traffic and will eventually serve voice and video needs. It is anticipated that the fiber-optic backbone will provide agencies with a single high-speed LAN capable of meeting LAN connectivity needs for at least 10 years. During the next five years, LAN traffic will continue to increase as agencies connect approximately 500 to 1000 microcomputers per year to the existing installed base. *Figure 13* illustrates the historical and projected increases in the numbers of intelligent and "dumb" (mainframe) terminals for fiscal years 1991-99. These statistics indicate a continuing decline in the use of dumb terminals and a steady increase in the use of intelligent terminals. This confirms that state agencies have become reliant on LANs to accomplish their IT responsibilities.

State of Montana

**Network Growth - Number of Terminals**
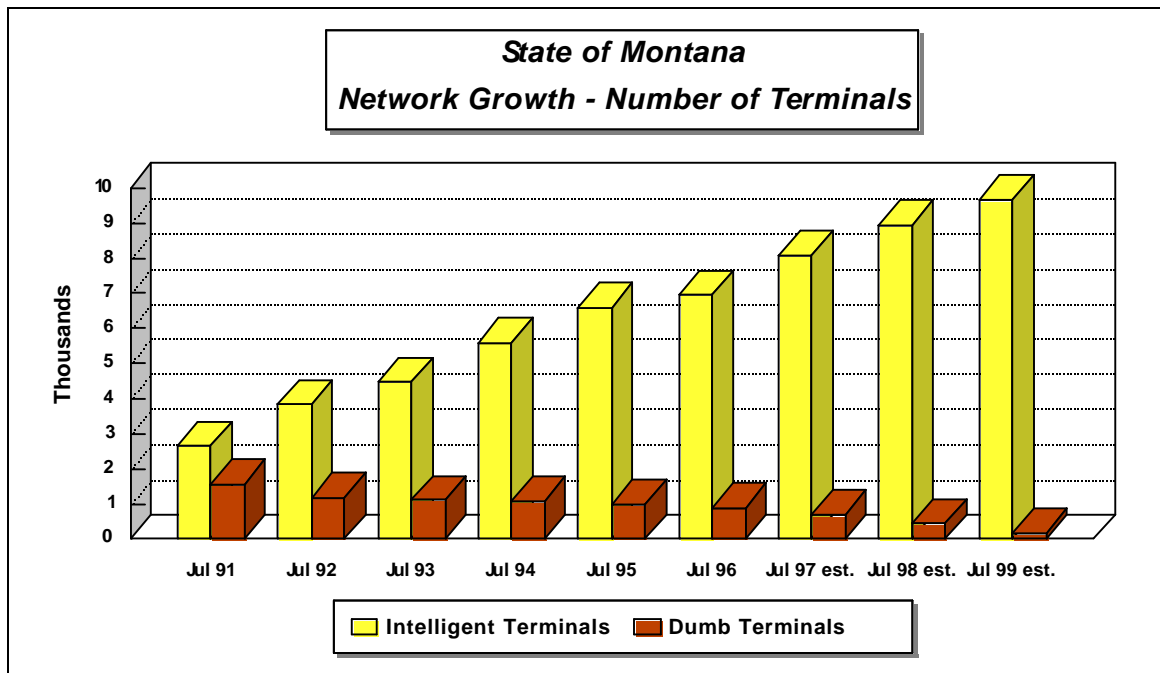
Voice Communications

ISD provides telephone service to all agency sites throughout Montana. In cooperation with the University System and state agencies, ISD manages Private Branch Exchanges (PBXs) at 23 sites (including six in Helena and eight at the university units) and smaller key telephone systems at more than 200 locations statewide. These 23 PBXs are connected through the STN facilities, thereby allowing the state to carry most of its internal traffic on the network without incurring incremental long-distance charges.

The STN provides local and long-distance calling capabilities for agencies throughout the state. ISD maintains contracts with AT&T, Sprint, and US West for intrastate, interstate, and international calling. This provides the state with substantial long-distance savings on calls made from state facilities or with a state credit card. During the next five years, the state will continue to contract for local and long-distance circuits to meet the increased demand for voice, data, and video communications.

The state began the active management of telephone systems in 1982 when it acquired its first PBX. Since that time, 23 additional PBXs, which manage more than 17,000 telephones, have been purchased. These PBXs provide on-campus and local calling services, and give access to the STN for long-distance calling. Additionally, these systems provide 800/900 services, fax communications, dial-in data calling, voice mail features, access for telecommunications devices for the deaf, and operator services. The state PBXs provide management for: telephone, limited WAN, SNA, SummitNet data-circuit, and METNET video-image services. During the next five years, the state will continue to upgrade PBXs to improve service capabilities and achieve telecommunication cost savings. *Figures 14 and 15* respectively, show actual long-distance usage and rate history for fiscal years 1991-96, and projected usage and rate history for fiscal years 1997-99.

Long-Distance Usage

Long-Distance Rates
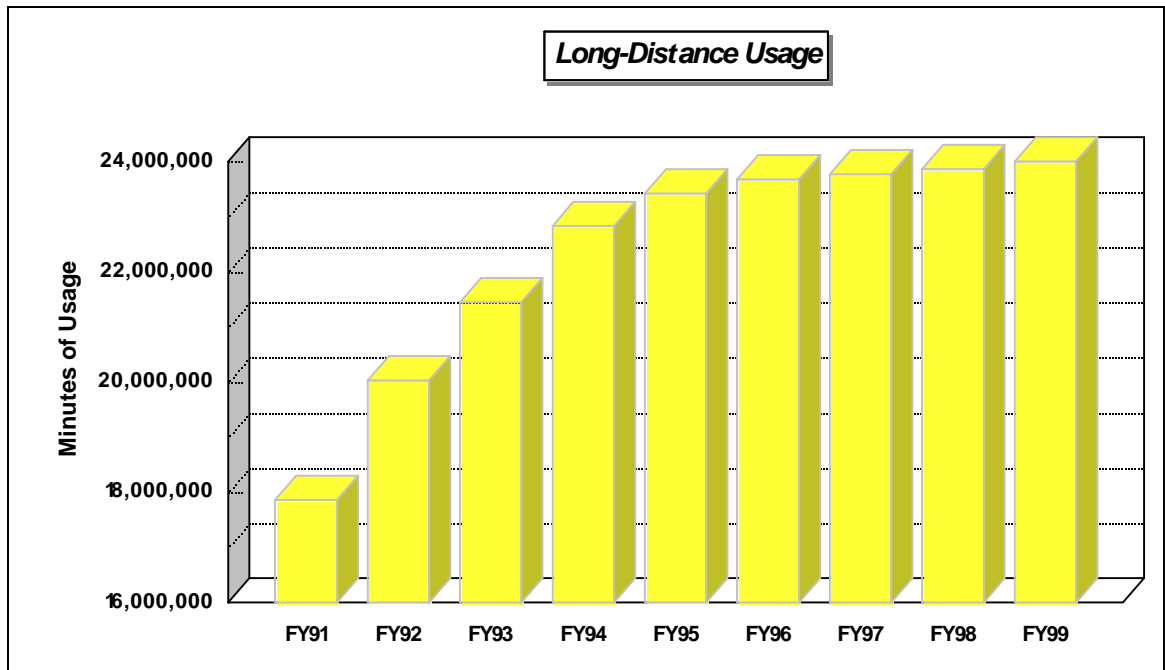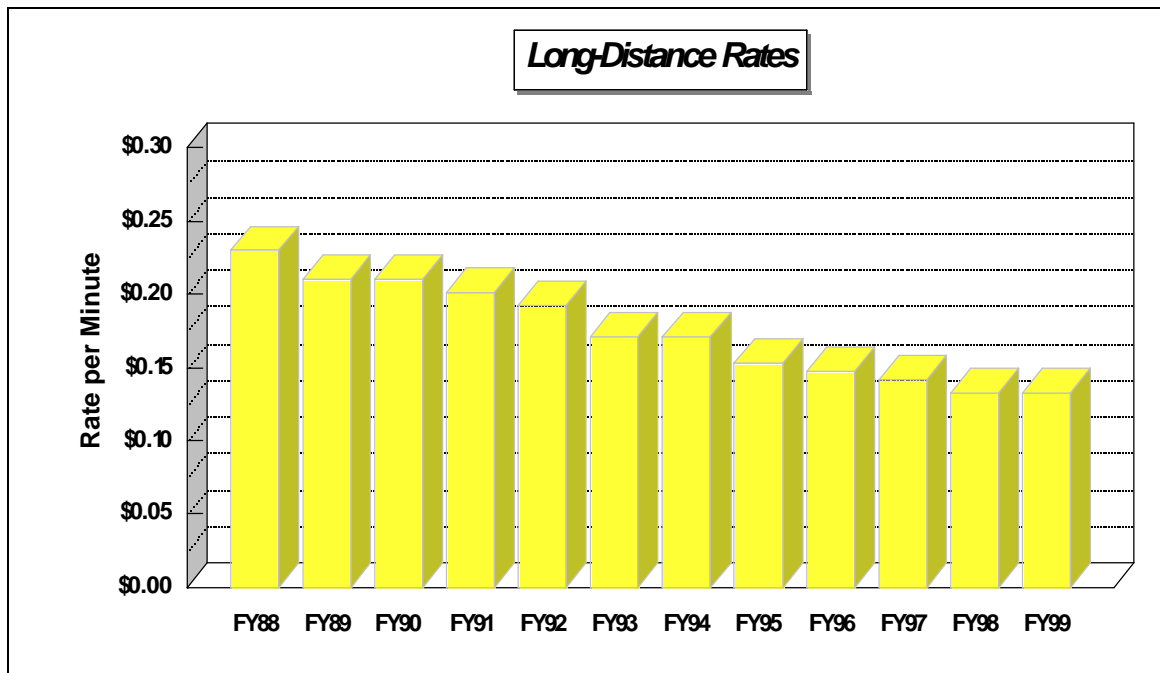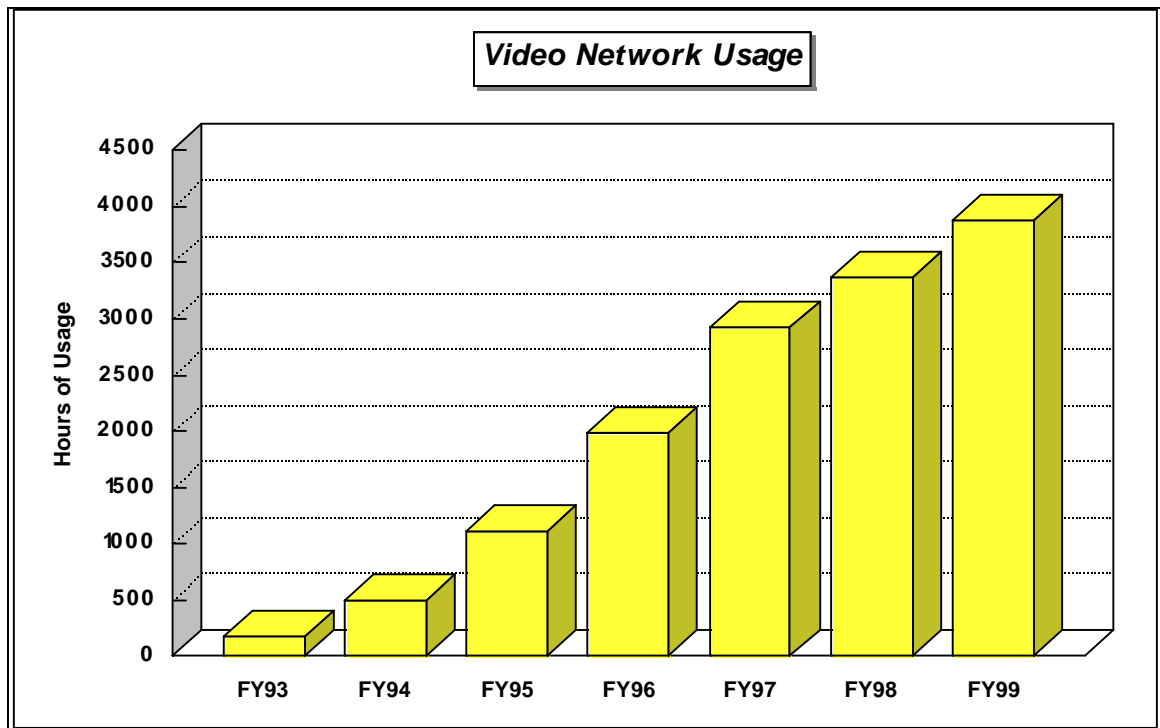

Video Communications

The Montana Educational Telecommunications Network (METNET: Two-way Interactive Video Network), managed through the University System and the Office of Public Instruction, provides distance learning opportunities for the State of Montana. The system is used primarily for the delivery of classroom instruction, in-service training for teachers, and interactive video conferences. Through METNET, Montanans are able to teach, learn, and share educational resources and opportunities.
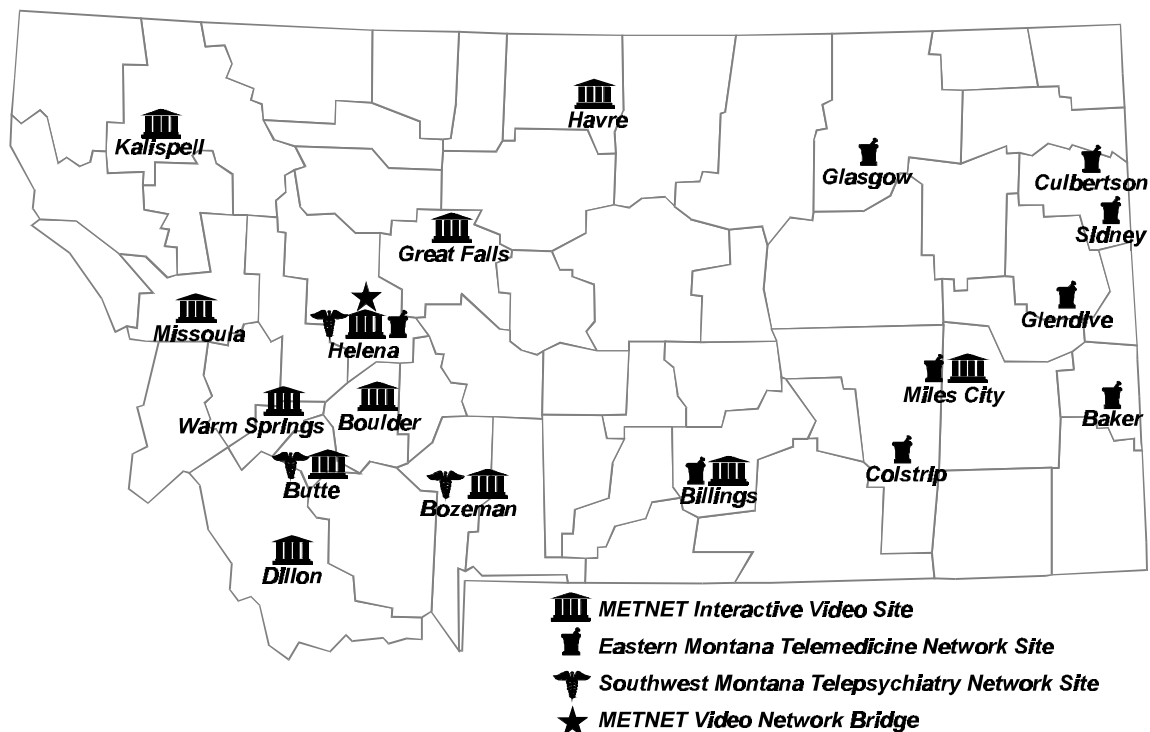
Virtually all types of telecommunication technologies and resources are used in METNET, including computers and data networks, satellite, interactive video, public telephone networks, and fiber optics. METNET video technology is based on two-way interactive video systems located in various cities throughout Montana (*Figure 16*). In 1992, systems were installed at Helena, Bozeman, Missoula, and Billings. Then during 1993-94, systems were added in Miles City, Kalispell, and Great Falls. During 1995-96, additional sites were added in Warm Springs, Boulder, and Helena to meet specific needs. Other sites added in 1996 were Dillon and Havre.

An agreement with a Montana Power Company subsidiary, Entech, provides a METNET site in Butte, and another agreement with the Deaconess Medical Center in Billings allows the interconnection with their video system. Testing is also underway to study the feasibility of interconnection with a video system operated by Mid-Rivers Telephone Cooperative in Eastern Montana. In addition, connections to the Eastern Montana Telemedicine network allow the state to reach into Eastern Montana.

Over the next five years, METNET will continue to deploy video network equipment at additional sites.   METNET has been, and will continue to be, a highly visible and successful program for the State of Montana. *Figure 17* shows actual video network usage for fiscal years 1993-96, and projected usage for fiscal years 1997-99.

Video Network Usage

Radio Communications

State radio planning and development activities have been concentrated in four areas: mutual aid communications; spectrum management; state and local system technical support; and future systems.

In anticipating long-term wireless communications needs, the state has focused on both conventional land-mobile systems, such as those used by public safety agencies for dispatching personnel, and advanced services such as cellular telephone and mobile data terminals. The distinctions between wired and wireless communications, and between closed private systems and open common-carrier services, are becoming less evident. The state's goal is to provide for current needs and to plan an efficient transition to future technology and the evolving needs of state and local communications systems users.

Mutual aid communications has proven to be the cornerstone of effective inter-agency cooperation during times of emergency. Plans, policies, and procedures have been developed that describe how shared radio frequencies licensed by the state can be put to use during incidents of any size. ISD has recently printed 3200 copies of the mutual aid communications handbook and has distributed it widely. This publication is used by public safety planning staff (from the smallest fire department to the largest state agency) as well as by communications trainers statewide. This program has proven to be one of the most effective solutions to public safety interoperability in the nation.

As the Federal Communications Commission's (FCC) liaison for public safety frequency

assignments in Montana, ISD is heavily involved in public safety coordination issues between state and local agencies. Planning is currently underway for Montana's next generation of public safety and general government radio systems. Pending FCC rules and regulations threaten to dramatically alter the radio landscape as we now know it. This action (commonly referred to as the FCC's "refarming" proposal) would require the replacement of equipment, over the next five to 15 years, with technology that is only currently beginning to emerge.

The existing rules and regulations were issued in their moderated form in 1995 and are currently under a moratorium pending input from a national advisory committee.   This respite has allowed the Public Safety Communications Task Force (consisting of state and local public safety representatives) time to prepare for regulatory changes, technological advances, and an increase in user needs. This task force is guiding the development of next-generation radio systems for use among multiple agencies and various levels of local government. The state has established a contract with a radio network architecture consultant, with the purpose of investigating the operational needs and requirements of state agencies and local governments. This effort will provide an analysis of needs and identify changes occurring in the technical and regulatory environments. This information will be used to provide a framework from which the state can plan and implement future communications systems.

Cellular/Wireless Systems

Planning for advanced wireless communications services has paralleled that of traditional land-mobile radio. Cellular telephone use by state agencies is growing and has proven to be an effective communications tool for agency personnel. While growth is expected to stabilize over time, a 50% biennial growth rate in the number of state cellular subscribers is anticipated for the foreseeable future. Cellular service is being used to provide mission-critical communications for states agencies as well as local governments. Cellular service is particularly useful for workers who travel a great deal, and for those who are not supported by the state's existing radio systems. In the past year, the state has contracted with CommNet Cellular to offer services to state agencies desiring cellular service.

During the next five years, cellular service will continue to expand into Montana communities, while subscriber costs will decline. This combination of trends will make cellular telephone service attractive and viable for state agencies.

9-1-1 Service

The statewide 9-1-1 Emergency Telephone System Program has been in place since 1987. *Figure 18* shows the areas in Montana with 91-1 service. ISD is charged with administering the funds and assisting local communities in planning and implementing 9-1-1 emergency telephone systems. Funding for the implementation and operation is generated through a monthly 25-cent fee on each telephone subscriber's access line, with some exceptions for non-taxable entities. The funds collected are allocated to local governments on a per capita basis after program administration and equipment costs have been deducted.

9-1-1 SERVICE AS OF MAY 1, 1996
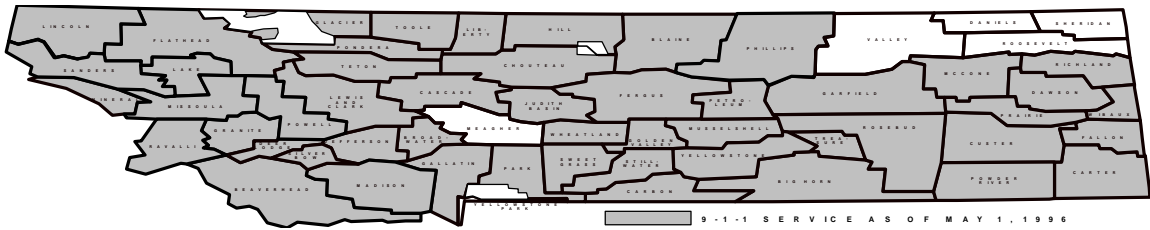
Most of the state's 9-1-1 systems provide minimum (basic) service, although a few have Automatic Number Identification (ANI) that displays the telephone number of the calling party. The greater Billings area now has Enhanced 9-1-1 (E9-1-1) that provides Automatic Location Identification (ALI) in addition to ANI. Across the state, local jurisdictions have expressed interest in upgrading their 9-1-1 systems to incorporate E9-1-1 features, but limited funding has made this conversion impossible for all but the most heavily populated areas.

At present, not all 9-1-1 emergency calls can be routed over dedicated trunks to the Public Safety Answering Points (PSAPs). Without dedicated trunks, ANI information can not be transmitted; 9-1-1 callers compete with other telephone users for time on the public switched telephone network; and the possibility exists that an emergency call could be blocked. Provision of universal access (dedicated trunks statewide) and enhanced features such as ANI have been recommended as a benchmark by the Department of Administration's 9-1-1 Advisory Council.